

Mammalia, Rodentia, Sigmodontinae, *Irenomys tarsalis* (Philippi, 1900) and *Geoxus valdivianus* (Philippi, 1858): Significant ecological range extension

Karla García^{1*}, Juan Carlos Ortiz¹, Mauricio Aguayo² and Guillermo D'Elía³

¹ Universidad de Concepción, Departamento de Zoología, Casilla 160-C, Concepción, Chile.

² Universidad de Concepción, Centro de Ciencias Ambientales EULA, Chile.

³ Universidad Austral de Chile, Instituto de Ecología y Evolución, Valdivia, Chile.

* Corresponding author. E-mail: kgarcia@udec.cl

ABSTRACT: We present the first records of the Chilean tree mouse (*Irenomys tarsalis*) and Valdivian long-clawed mouse (*Geoxus valdivianus*) in non-native forestry plantations. Despite being characterized as forest species, specimens of *I. tarsalis* and *G. valdivianus* were captured within a 30-year-old *Pinus contorta* plantation in Coyhaique National Reserve. These records show our limited understanding of this fauna and suggest the need for further surveys and monitoring, including disturbed habitats.

The mammal fauna of Chile is one of the best known in the Neotropics. Nonetheless, new taxa and distribution records are often reported, suggesting that the diversity and distribution of Chilean mammals is still not completely known (e.g., Patterson 1992; Hutterer 1994; Kelt and Gallardo 1994; Saavedra and Simonetti 2001; D'Elía *et al.* 2006). The rodent species of Chilean Patagonia includes widely distributed sigmodontines such as *Abrothrix longipilis* (Waterhouse, 1837), *Abrothrix olivaceus* (Waterhouse, 1837), *Loxodontomys micropus* (Waterhouse, 1837), and *Oligoryzomys longicaudatus* (Bennett, 1832); while, other species in southern Patagonia, such as *Irenomys tarsalis* (Philippi, 1900) and *Ctenomys coyhaiquensis* Kelt and Gallardo, 1994, have a more restricted distribution.

The Chilean tree mouse *Irenomys tarsalis* is a sigmodontine rodent endemic to the Andean forests and forest-steppe ecotones of southern Chile and Argentina (Kelt 1993). It is a relatively rare element in the fauna of southern Chile and adjacent areas of Argentina (Osgood 1943; Meserve *et al.* 1988, 1991; Patterson *et al.* 1989, 1990; Kelt *et al.* 1999). As is common for rare species, the limits of the tree mouse's geographic and ecological ranges are poorly documented (Kelt *et al.* 2008). Since its original description, knowledge on *Irenomys tarsalis* is limited to information on its distribution (e.g., Pardiñas *et al.* 2004), some aspects of its natural history (e.g. Pearson 1983; Kelt 1993, 1994; Saavedra and Simonetti 2000), its chromosome characterization (Ojeda *et al.*, 2004) and its controversial phylogenetic position (e.g. Smith and Patton 1999; D'Elía 2003). Kelt (1993) summarized the knowledge of this species and reported its occurrence from Chillán in the Ñuble Province (Bio Bio Region) to Chile Chico in the south of the Aysén Region. Later, Saavedra and Simonetti (2000) documented an apparently isolated population in Los Queules National Reserve, thereby extending its known distribution around 200 km to the north. Finally, in the compilation of Argentine records by

Pardiñas *et al.* (2004), the known distribution in Argentina was extended both northward and southward. Kelt (1994, 1996) indicated that *I. tarsalis* is usually found in wooded habitats, and Figueroa *et al.* (2001) indicated that this species is strictly associated with dense, humid forest environments. In Aysén, it is distributed specifically in the boreal and humid ecoregions.

Even less is known about *Geoxus valdivianus* (Philippi, 1858). The information on this species is limited to a scattered data on its distribution and habitat use (e.g. Figueroa *et al.* 2001; Saavedra and Simonetti 2001; 2003; 2005; Lobos *et al.* 2005; Elgueta *et al.* 2006) and recently preliminary information on its pattern of geographic variation was provided by Lessa *et al.* (2010). In Chile, it occurs between the provinces of Ñuble and Magallanes (Reise and Venegas 1987; Redford and Eisenberg 1992). *Geoxus valdivianus* inhabits dense forests, although it is occasionally dispersed in mallin habitats (low-lying Patagonian wetlands) along forest edges. This species inhabits thick brushwood habitats near Coyhaique Alto, in the eastern part of the Aysén Region (Kelt 1994; Figueroa *et al.* 2001).

This note provides new records of *Irenomys tarsalis* and *Geoxus valdivianus* in an uncharacteristic ecological habitat for these species. Thus, we believe that this observation deserves recognition in the literature.

The study area is located 5 km north of the city of Coyhaique (Aysén Region, Chile) on a ~30-year-old forestry plantation of *Pinus contorta* (Dougl. ex Loud) in the Coyhaique National Reserve (44°70' S, 72°08' W) (Figure 1). The plantation is about 1 km away from the nearest native forest remnant, which has been affected by the installation of a camping area in the reserve. The nearest forest and regrowth area for *lenga* [*Nothofagus pumilio* (Poepp et Endl.) Krasser] free of anthropogenic influence is some 2.5 km from the plantation. Despite the isolated presence of native trees belonging to the families Poaceae, Grossulariaceae, Berberidaceae, and Apiaceae, the

terrain has almost no native undergrowth stratum (Figure 2).

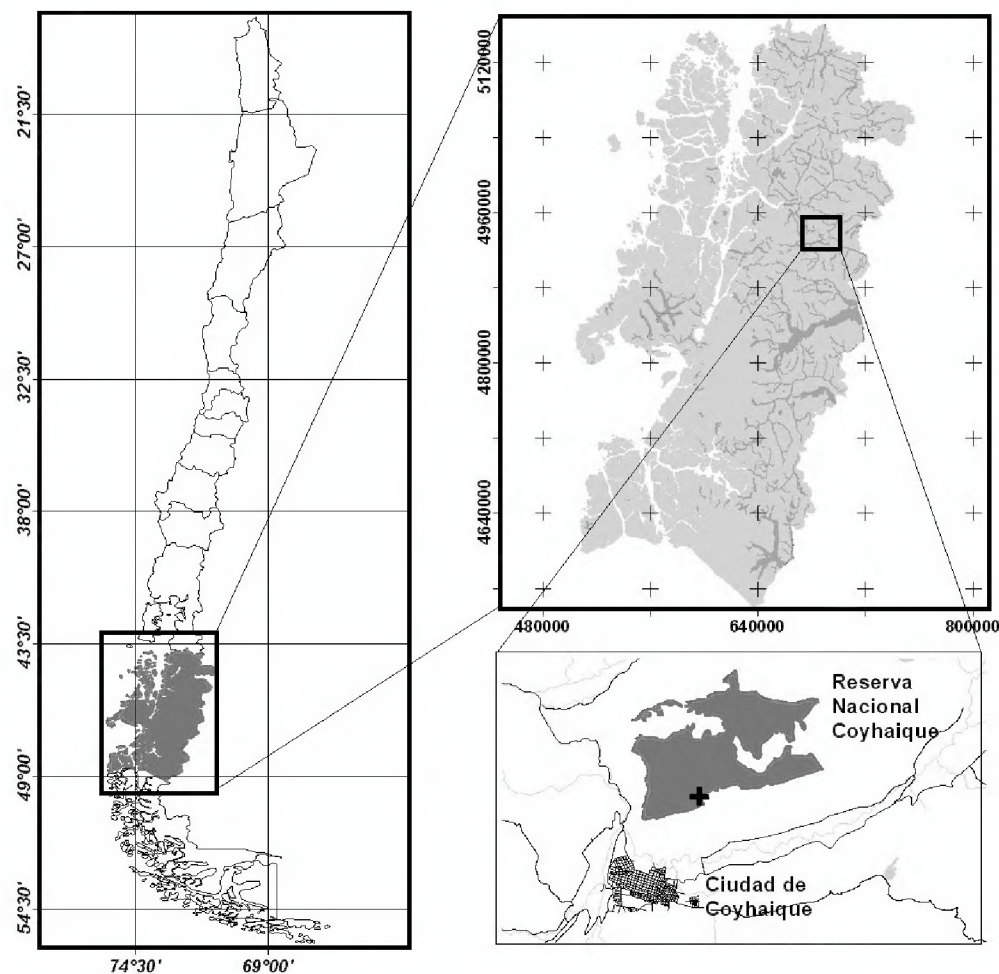


FIGURE 1. Location of the study area in the Coyhaique National Reserve, Aysén Region, Chile.

Field collection was done using 121 Sherman traps that were monitored for four consecutive nights in April and November 2008. All traps were placed on the ground. Manipulation of captured individuals followed the protocol of the American Society of Mammalogists (Gannon *et al.* 2007) and the collection permits issued by the Servicio Agrícola y Ganadero de Chile (SAG; Resolución exenta N° 29 of January, 2008). The work authorization in the Coyhaique National Reserve was granted by the Corporación Nacional Forestal (CONAF) of the Aysén Region. Collected specimens were deposited in the Museo de Zoología de la Universidad de Concepción, Chile and Colección de Mamíferos de la Universidad Austral de Chile, Valdivia, Chile.

We captured one specimen of *Geoxus valdivianus* and one of *Irenomys tarsalis* on a *Pinus contorta* forestry plantation, in April and November respectively. Both individuals were prepared as fluids and tissue samples (36183 MZUC – UCCC and 7141 IEEUACH; deposited in the Museo de Zoología de la Universidad de Concepción and in the Colección de Mamíferos de la Universidad Austral de Chile, Valdivia, respectively) and were adult animals based on size. This is an anomalous ecological habitat for these species. Other sigmodontines caught during this campaign include *Abrothrix longipilis*, *A. olivaceus*, and *Oligoryzomys longicaudatus*. All of these species had been previously recorded on forestry plantations (*e.g.*, Saavedra and Simonetti 2005; García and Ortiz unpublished data).

These records constitute the first documentation of *Irenomys tarsalis* and *Geoxus valdivianus* in this type of habitat dominated by an exotic species. In fact, in a report that extended the known distribution of *G. valdivianus* nearly 200 km northward, Saavedra and Simonetti (2001) pointed out that neither *Geoxus* nor *Irenomys* were caught in the grid of traps set up within a forestry plantation.

In line with our results, recently Kelt *et al.* (2008)

documented *I. tarsalis* in a shrubby habitat along a stream near the arid end of the transition from temperate rain forest to steppe in the Aysén Region; this was the first record of this species in such an environment, extending its ecological distribution to brushwood habitats.

Further studies are needed to clarify if in Aysén *Irenomys* and *Geoxus* are in fact, inhabiting pine plantations or if they just accidentally entered this habitat. The fact that our specimens were not juvenile seems to indicate that these specimens may not be dispersing individuals, which shows a greater ecological tolerance by these species than previously thought. Also, our records show that these species have high dispersal abilities since they were surveyed far from the closest forest patch.

In addition, the discovery of a specimen of *Irenomys tarsalis* and another of *Geoxus valdivianus* on a *Pinus contorta* forestry plantation helps broaden our understanding of the region's natural history. These records highlight our limited knowledge of this fauna and show the need to carry out additional field work and implement monitoring efforts that include disturbed and non-native habitats, which are dramatically increasing in area in Chile.



FIGURE 2. *Pinus contorta* plantation where the *Irenomys tarsalis* and *Geoxus valdivianus* specimens were found in Coyhaique National Reserve, Aysén.

ACKNOWLEDGMENTS: This work was financed by the projects Fondecyt 1070511, Fondecyt 11070157, and DIUC Semilla Patagonia 205.113.066 of the Universidad de Concepción. We thank the Servicio Agrícola y Ganadero (SAG) for the collecting permits and the Corporación Nacional Forestal (CONAF) of the Aysén Region for allowing us to work in the Coyhaique National Reserve. We also appreciate Guillermo Solar, and Víctor Carumilla Reserve Park Ranger, who provided excellent help and assistance during field work.

LITERATURE CITED

- D'Elía, G. 2003. Phylogenetics of Sigmodontinae (Rodentia, Muroidea, Cricetidae), with special reference to the akodont group, and with additional comments on historical biogeography. *Cladistics* 19: 307-323.
- D'Elía, G., A. Ojeda, F. Mondaca and M.H. Gallardo. 2006. New data of the long-clawed mouse *Pearsonomys annectens* (Cricetidae, Sigmodontinae) and additional comments on the distinctiveness of *Pearsonomys*. *Mammalian Biology* 71: 39-51.
- Elgueta, E., S. Reid, P. Plischoff, M.A. Méndez, J. Núñez and C. Smith-Ramírez. 2006. Catastro de vertebrados terrestres y análisis en seis hábitats presentes en la National Reserve Futaleufú, Provincia de Palena, X Región, Chile. *Gayana* 70: 195-205.

- Figueroa R., S. Corales, J. Cerda and H.S. Pérez. 2001. *Roedores, rapaces y carnívoros de Aysén*. Ayén: Servicio Agrícola y Ganadero, Gobierno Regional de Aysén, XI Región. 195 p.
- Gannon, W.L., R.S. Sikes and Animal Care and Use Committee. 2007. Guidelines of the American Society of Mammalogists for the use of wild mammals in research. *Journal of Mammalogy* 88: 809-823.
- Hutterer, R. 1994. Island rodents: a new species of *Octodon* from Isla Mocha, Chile (Mammalia: Octodontidae). *Zeitschrift für Säugetierkunde* 59: 27-51.
- Kelt, D.A. 1993. *Irenomys tarsalis*. *Mammalian Species* 447: 1-3.
- Kelt, D.A. 1994. The natural history of small mammals from Aisén Region, southern Chile. *Revista Chilena de Historia Natural* 67: 183-207.
- Kelt, D.A. 1996. Ecology of small mammals across a strong environmental gradient in southern South America. *Journal of Mammalogy* 77: 205-219.
- Kelt, D.A. and M. Gallardo. 1994. A new species of tucu tucu, genus *Ctenomys* (Rodentia: Ctenomyidae) from Patagonia Chile. *Journal of Mammalogy* 57: 338-348.
- Kelt, D.A., P.L. Meserve, B.D. Patterson and B.K. Lang. 1999. Scale dependence and scale independence in habitat associations of small mammals in southern temperate rainforest. *Oikos* 85: 320-334.
- Kelt, D.A., A. Engilis Jr., I.E. Torres and A.T. Hitch. 2008. Ecologically significant range extension for the Chilean tree mouse, *Irenomys tarsalis*. *Mastozoología Neotropical* 15(1): 125-128.
- Lessa, E.P., G. D'Elía and U.F.J. Pardiñas. 2010. Genetic footprints of late Quaternary climate change in the diversity of Patagonian-Fuegian rodents. *Molecular Ecology* 19: 3031-3037.
- Lobos, G., A. Charrier, G. Carrasco and R.E. Palma. 2005. Presence of *Dromiciops gliroides* (Microbiotheria: Microbiotheriidae) in the deciduous forests of central Chile. *Mammalian Biology* 70: 386-390.
- Meserve, P.L., B.K. Lang and B.P. Patterson. 1988. Trophic relationships of small mammals in a Chilean Temperate rainforest. *Journal of Mammalogy* 69(4): 721-730.
- Meserve, P.L., D.A. Kelt and D. Martínez. 1991. Geographical ecology of small mammals in continental Chile Chico, South America. *Journal of Biogeography* 18: 179-187.
- Ojeda, A.A., C.A. Ríos and M.H. Gallardo. 2004. Caracterización cromosómica de *Irenomys tarsalis* (Rodentia, Cricetidae, Sigmodontinae). *Mastozoología Neotropical* 11: 95-98.
- Osgood, W.H. 1943. The mammals of Chile. Field Museum of Natural History. *Zoology Series* 30: 1-268.
- Pardiñas, U., S. Cirignoli, J. Laborde and A. Richieri. 2004. Nuevos datos sobre la distribución de *Irenomys tarsalis* (Philippi, 1900) (Rodentia: Sigmodontinae) en Argentina. *Mastozoología Neotropical* 11(1): 99-104.
- Patterson, R.D. 1992. A new genus and species of long-clawed mouse (Rodentia: Muridae) from temperate rainforests of Chile. *Zoological Journal of The Linnean Society* 106: 127-145.
- Patterson, B.D., P.L. Meserve and B.K. Lang. 1989. Distribution and abundance of small mammals along an elevational transect in temperate rainforest of Chile. *Journal of Mammalogy* 70: 67-78.
- Patterson, B.D., P.L. Meserve and B.K. Lang. 1990. Quantitative habitat association of small mammals along an elevational transect in temperate rainforest of Chile. *Journal of Mammalogy* 71: 620-623.
- Pearson, O.P. 1983. Characteristics of a mammalian fauna from forests in Patagonia, southern Argentina. *Journal of Mammalogy* 64: 476-492.
- Pine, R.H. 1982. Current status of South American mammalogy; p. 27-37. In M.A. Mares and H.H. Genoways (ed.). *Mammalian biology in South America*. Pittsburgh: Special Publication Series, Pymatuning Laboratory of Ecology, University of Pittsburgh.
- Redford, K.H. and J.F. Eisenberg. 1992. *Mammals of the Neotropics: the Southern cone. Chile, Argentina, Uruguay, Paraguay*. Chicago: The University of Chicago Press. 430 p.
- Reise, D. and W. Venegas. 1987. Catalogue records, localities and biotopes from researchwork small mammals in Chile and Argentina. *Gayana* 51: 103-130.
- Saavedra, B. and J. Simonetti. 2000. A northern and threatened population of *Irenomys tarsalis* (Mammalia: Rodentia) from central Chile. *Zeitschrift für Säugetierkunde* 65: 243-245.
- Saavedra, B. and J. Simonetti. 2001. New records of *Dromiciops gliroides* (Microbiotheria: Microbiotheriidae) and *Geoxus valdivianus* (Rodentia: Muridae) in central Chile: their implications for biogeography and conservation. *Mammalia* 65: 96-100.
- Saavedra, B. and J. Simonetti. 2003. Past and present small mammals of Isla Mocha (Chile). *Mammalian Biology* 68(6): 365-371.
- Saavedra, B., and J. Simonetti. 2005. Micromamíferos en fragmentos de bosque Maulino y plantaciones de pino aladañas; p. 532-536. In C. Smith-Ramírez, J. Armesto and C. Valdovinos (ed.). *Historia, biodiversidad y ecología de los bosques costeros de Chile*. Santiago: Editorial Universitaria Santiago.
- Smith, M.F. and J.L. Patton. 1999. Phylogenetic relationships and the radiation of sigmodontine rodents in South America: evidence from cytochrome b. *Journal of Mammalian Evolution* 6(2): 89-128.

RECEIVED: June 2010

LAST REVISED: November 2010

ACCEPTED: March 2011

PUBLISHED ONLINE: May 2011

EDITORIAL RESPONSIBILITY: Ana Paula Carmignotto